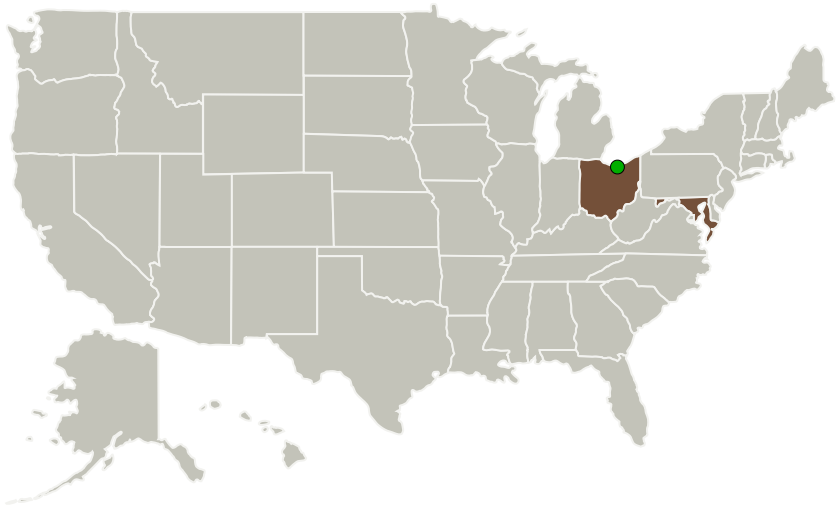
Fluidic Fuel Flow Modulation for Active Combustion Control, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

We propose a novel method of high frequency, high control authority fluidic modulation of pilot fuel flow to enable implementation of active combustion instability control (ACIC) either by feedback control or decoupling of the heat release frequency with that of the resonance frequency of the combustion chamber. The possible rugged design of the fluidic device permits its installation in the harsh environment right upstream of the fuel injector thus enabling closer coupling for high-fidelity control action. The method also provides a means of accurate measurement of fuel flow metered through the device. In Phase I, we propose design, fabrication and testing of two fluidic methods of pulsing the fuel — one method is driven by a fluidic oscillator and a second method by a vortex diode using an externally triggered pulse for phase controlled pulsations. In Phase II, based on the obtained performance characteristics and the customer needs, we will down-select the best of the options for further development.

Primary U.S. Work Locations and Key Partners



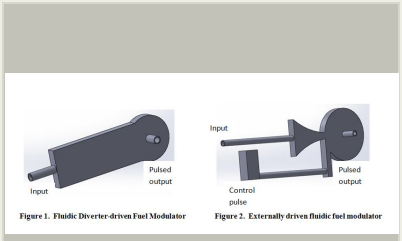


Figure 1. Fluidic Diverter-driven Fuel Modulator

Figure 2. Externally driven fluidic fuel modulator

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Organizations Performing Work	Role	Type	Location
Advanced Fluidics, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Ellicott City, Maryland
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Maryland	Ohio

Project Transitions

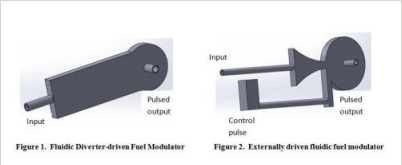
June 2016: Project Start

December 2016: Closed out

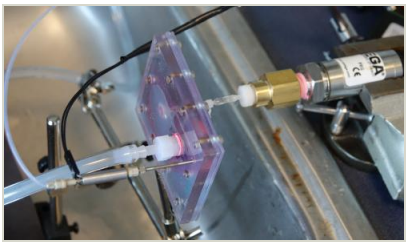
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139672)*

Images



Briefing Chart Image
Fluidic Fuel Flow Modulation for Active Combustion Control, Phase I *(https://techport.nasa.gov/image/127876)*



Final Summary Chart Image
Fluidic Fuel Flow Modulation for Active Combustion Control, Phase I Project Image *(https://techport.nasa.gov/image/133877)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Advanced Fluidics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

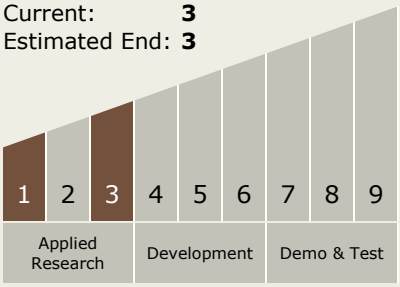
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Surya Raghu

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.5 Turbine Based Jet Engines

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System